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ABSTRACT

The relationship between higher education and economic development is discussed to help Pennsylvania state officials in policy development. In addition to listing labor force development efforts of Carnegie Mellon University, Community College of Allegheny County, and University of Pittsburgh, Massachusetts' economic strategies are summarized. Six key considerations for economic redevelopment for the 1980s are identified: linkages among business/industry, government, and university are essential; colleges and universities have been key actors in successful recent state and regional economic development activities; universities are excellent sites for conducting basic research and development (R&D), which is important to economic growth; the federal government has urged universities to seek more private sector R&D; colleges should help prepare workers for technical changes; and higher education should play a greater role in human resource planning and training. Strategies that Pennsylvania might follow to strengthen the higher education system are suggested. To help staff members of the House Higher Education Sub-Committee, an annotated bibliography is provided, covering 12 texts/journals, 9 documents about Pennsylvania, 4 documents about other states' strategies, and 8 organizations. (SW)

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TO

House Sub-Committee on
Higher Education

FROM

Judith Anne Beachler
University of Pittsburgh

"Higher Education and Economic Development:
A Relationship" LORL Inquiry #030-85-034

March 15, 1985

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What follows is a paper which provides an historical perspective, an annotated bibliography, and a preliminary policy framework for consideration by the House Higher Education Sub-Committee as it studies the relationship between higher education and economic development.

The Legislative Office for Research Liaison (LORL) researches issues/problems with scientific and technologic or technical components primarily through faculty members at several universities in the Commonwealth. The views expressed are those of the persons responding to a LORL inquiry and do not necessarily reflect the official position of the individual responder's organization.

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I. INTRODUCTION

The State of Pennsylvania (PA) has experienced major changes in its economic well-being over the past ten years, particularly as it struggled with problems through the 1980-82 national recession which affected PA deeper and for a longer period of time than many states. In 1972, the PA unemployment rate was .2% below the national average of 5.6%. By 1976, that .2% figure was reversed as PA's annual average was 7.9%; from that point in time unemployment in PA increased rather dramatically, peaking in 1983.

RATE OF UNEMPLOYMENT FOR PA AND US: 1978-84

	1978	1979	1980	1981	1982	1983	1984
PA	6.9	6.9	7.8	8.4	10.9	11.8	9.1
US	6.1	5.8	7.1	7.6	9.7	9.6	7.5

1984 marked a year of optimism for PA as its unemployment rate began to subside and the concerted efforts of business, government and educational institutions began to take shape to restrengthen PA's economy. At this crossroad in time for economic redevelopment, it is important to begin to assess just what role various groups can play in order to assure long term economic well-being.

The purpose of this paper is to look at the relationship between higher education and economic development, using a historical perspective. The requesting legislator specifically desired a focus on PA. However, the scope of the paper enlarges the focus for two reasons. Firstly, information regarding the relationship between higher education and economic development is limited. Secondly, since PA is in the early phases of its redevelopment effort, its policy makers can perhaps benefit from the experience of states which have reduced their rates of unemployment and strengthened their economies as well.

The timing of this inquiry from the LORL Office shows foresight. A series of studies looking at the quality of education at the lower levels in relation to economic growth have recently been completed. National research commissions are beginning to focus on higher education in this same way. For example, the Education Commission of the States has made the topic of this LORL inquiry a research priority. Their findings may be of value to PA as it attempts to establish its policy framework. Further, the federal government's position regarding its role in economic redevelopment has been made clear. The Reagan Administration has taken a strong position that a state and/or regional, rather than a national approach is required to move the nation toward reindustrialization in the late 1980's. State governments across the country are searching for ways to mount programs for economic growth. Institutions of higher education are an important resource that can contribute substantially to improving the health of the economy at both the state and national levels.

II. ECONOMIC DEVELOPMENT

In the literature that has been generated over the last three to four years about policy for US reindustrialization, analogies have been made to developmental economies. Viewing the US as an underdeveloped economy gives us lessons to follow, both from our own past and from the current attempts to aid third world countries in their development. There are seven critical elements that are necessary for economic development:

- -transportation
- -finance and legal institutions
- -energy
- -communication
- -capital goods/equipment
- -research and development
- -human resources

In order to have a strong economy there must be strength in these seven components of "capital infrastructure." It has been charged that only one of the seven foundations for US economic revitalization--communication networks--is considerably strong. (Etzioni, 1983)

Much of the reindustrialization literature suggests that we are entering an era of human capital development and that the key to successful economic redevelopment will be in two areas: 1) research and 2) education and training. Both must be designed to foster a resourceful, flexible and enthusiastic workforce for an economy that will be shifting swiftly among changing technologies. Human resources are the nation's chief natural resource which is critical for economic renewal:

> "All history--as well as all current experience--points to the fact that it is man, not nature, who provides the primary resource: that the key factor of all economic development comes out of the mind of man..... In a real sense, therefore, we can say that education is the most vital of all resources." (Schumacher, E.F., 1973, p.79.)

Statistics show that the US is moving away from an economy based primarily upon traditional industries toward one which is more complex and based upon new technologies. As a result, there will be a greater need for high levels of education and training of the work force. The changing composition of PA's work force over the past ten years also enforces this fact.

EMPLOYED PERSONS AS A PERCENT OF POPULATION*

	1970	1980	Change
Agriculture, Forestry, Fisheries	1.8%	1.6%	-.2%
Mining	.9%	1.1%	+.2%
Construction	5.4%	4.8%	-.6%
Manufacturing	34.1%	28.6%	-5.5%
Transportation, Commerce & Other Public Utilities	6.4%	7.0%	+.6%
Wholesale & Retail Trade	18.8%	19.6%	+.8%
Finance, Insurance Real Estate	4.2%	5.2%	+1.0%
Services	23.6%	27.4%	+3.8%
Public Administration/Government	4.7%	4.6%	-.1%

*Adapted from Census of the Population Statistics, 1970 and 1980

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A glance at the above table shows a pattern of change (loss in traditional manufacturing jobs and gain in service jobs) which has been projected to continue at a much more rapid pace over the next ten years. Once the heart and soul of the PA economy, manufacturing lost 215,000 jobs in the 1970's. This change was accompanied by a low rate of start-ups for new businesses for the provision of new jobs. Efforts which are being made across the State are beginning to change this as evidenced by an increase in service and related white collar industries. (Pierce and Hagstrom, 1983) Attempts are also starting to be made to encourage small high tech manufacturing firms to start-up their operations in the Commonwealth. (Pittsburgh Press, February, 1985)

III. HIGHER EDUCATION: ADVANCING HUMAN CAPABILITY IN SOCIETY

According to a 1973 Carnegie Commission report, Higher Education (HE) is involved in advancing human capability in many ways:

- -Research that provides new ideas and better technology
- -Service that distributes the new ideas to agriculture, industry, government, the professions, voluntary agencies, and individuals
- -Finding talent and developing it to its maximum useful level
- -Aiding talented persons to direct themselves toward the areas of greatest economic and social need
- -Drawing more people-particularly women and members of underprivileged minority groups-into the active labor force and adding to their geographic and occupational mobility
- -Adding to the individual skills of persons throughout life and thus to their "social returns" to society, as well as to their individual incomes
- -Advancing the levels of health of the people through research, training, and advisory service to health care institutions
- -Providing educational and cultural opportunities for the public at large
- -Generally adding to the capacity of society to adjust to change, to solve its problems, and to handle emergency situations more effectively

By collapsing the list above into two major categories, one could say that HE has a major responsibility for 2 of the 7 components of capital infrastructure necessary for economic development:

1. developing and making available new ideas and new technology through its research and development (R&D) efforts.
2. training talent and guiding it to greater usefulness, through its efforts in providing a highly trained work force.

In terms of R&D efforts, US colleges and universities have been worldwide leaders in basic research activity, which is critical to a nation's long term economic development. Approximately 69% of US basic research occurs in universities. (Carnegie Foundation for the Advancement of Teaching, 1980) University scientists have opened up major new frontiers of industrial technological development over the past 35 years,

including chemistry and the subsequent chemical industry; computer based technologies; advanced agricultural engineering; and biomedical engineering.

However, the US has lost its worldwide competitive edge in R&D efforts. By the mid-1970's, basic research was a significantly smaller portion of the US research budget than that of Japan, West Germany, France, UK and Canada. (Carnegie Foundation for the Advancement of Teaching, 1980) In 1976, Pennsylvania's universities and colleges received approximately $250 million annually in federal support for R&D. (Smigel, 1976) By 1983, institutions reported spending a total of $273.7 million on R&D (PA Department of Education, 1984) This comparison highlights a rather meager increase in R&D funding in PA over the nine year period.

In terms of providing college-educated persons PA's community colleges, state colleges and universities, state-related universities and private institutions of higher education have done reasonably well. In 1983, a total of 93,976 degrees (on the associate degree level and higher) were conferred, representing a 7.6% increase since 1976. (PA Department of Education, 1983, 1984)

IV. EVALUATING THE IMPACT OF HIGHER EDUCATION ON ECONOMIC DEVELOPMENT

Does higher education (HE) actually have an impact upon economic development? From the land grant college movement in the 1860's to the present, many policies have been established based upon the premise that colleges and universities are effective in human capital formation. Though this issue is extremely complex, there is evidence that education does contribute to economic growth. Groves (1961) showed a strong correlation between education (on all levels) and per capita income by two types of comparative analyses--of industrialized countries and of US states, using natural resources as a control. Even countries (and states) that had low levels of natural resources and high educational development, had per capita income which was in the median range; conversely, those with high levels of natural resources and low educational development experienced relatively low levels of per capita income.

Relating US unemployment figures (US Bureau of Labor Statistics, 1983) to economic development, the lower the level of education, the higher the level of unemployment. In 1982, levels were as follow:

Education Level	US Unemployment Rate
Less than 4 year high school	19.0%
4 year high school	12.0%
1-3 year college	8.1%
4 year college	4.7%
5 year college	3.4%
6 or more year college	2.4%

Other studies show strong positive relationships between schooling and labor force participation. (Davis and Morrall, 1976) Studies by T.W. Schultz in 1930, 1957 and 1972 showed that investment in education yielded a return in the form of faster

than otherwise rates of growth of national income and that the services of labor account for approximately 4/5 of the output of the US economy, with the remainder coming from the productive services of physical capital.

A recent series of studies conducted by the PA Economy League focused on the immediate net economic contributions of PA institutions of HE. These are the factors which have "direct impact" upon the economy, and include institutional spending, revenues generated (tuition), number of jobs created, and the like. (1981) However, this study does not look at "indirect impact". These include services to the community; technical consulting; formal R&D activities and their subsequent advances in technical, medical and social fields of knowledge; quality of education/training; and the like. In other words, the impact of formal HE goals were not evaluated in economic terms. Indirect impacts are extremely difficult to measure, and it is becoming increasingly important for qualified persons to develop appropriate instruments for their assessment.

An economic model developed for the American Council on Education (ACE is the major national association of institutions of higher education) was designed to show the impact of college money as it flows through the economy. A recent use of this model suggests that the most significant impact does not appear to rise from the flow of funds through a college, but rather from those indirect impacts of education on productivity of the work force. (Littlefield, 1982) This kind of research is extremely important for two reasons. First, refinement of methodologies to measure indirect impacts will give states and their respective colleges and universities clearer pictures of their total contributions. Second, colleges and universities need to know more about how their contributions to overall productivity of the workforce can be further enhanced. Institutional outcomes will be more clearly understood and accountability will be heightened.

V. HISTORICAL PERSPECTIVE

HE has long been viewed by many as a method for increasing economic growth. Throughout HE's history in the US, state and federal support has been allocated for two basic purposes: equalization of education opportunity (EEO) and as a strategy for economic growth. Funding for the goal of EEO was largely non-existent until 1965. Beginning with the establishment of land grant colleges, it was economic growth or a goal related to economic growth that provided the impetus for governmental support.

Land grant colleges were established by states under the auspices of the Morrill Act, passed by Congress in 1862. The federal government appropriated 20,000 acreas of public land, as well as grants to the states to be applied to endow and maintain at least one college per state whose purpose was "to teach such branches of learning as are related to agriculture and mechanics arts...in order to promote the liberal and practical education of the industrial classes in the several pursuits and

professions of life." (from the Morrill Act) PA's grant was utilized to support the Agriculture College of PA (presently known as Penn State University), which was established by the General Assembly in 1857. Thus, the Morrill Act required a legal commitment from PA that required the Agriculture College to provide agricultural research programs and extension services to the community.

The first PA institution of HE was a private college in the group of nine colonial colleges established between 1636-1769. Though education of ministers was the purpose of the other eight, the College of Philadelphia was established as a medical school. This college (now the University of PA) was the first of what was to be a strong and rather prestigious group of private HE institutions in the Commonwealth. In addition, the city of Philadelphia established its heritage as the medical center of the nation from the late 18th through the 19th century.

In an effort to establish teacher training centers, many states like PA, established State Normal Schools. Millersville University and Edinboro University became the Commonwealth's first two in 1857 (the same year that the Agriculture College was established). The number grew to 14 by 1932, at which time the General Assembly authorized their status as state teachers colleges with the authority to grant Bachelor of Science degrees. (Sack, 1963)

By the late 1890's there was a great concern for the application of science to technology. This trend gave rise to the establishment of separate science curricula and engineering programs which included intensive scientific and mathematics courses. PA's system of private colleges and universities was joined by three institutes of technology. Lehigh University's Polytecnic College (1886), Drexel Institute of Technology (1891) and Carnegie Institute of Technology (1905) were established with strong ties to business and industry. They derived their existence from the beneficence of wealthy individuals who were interested in establishing industrial schools of art, science and industry. (Sack, 1963) They have all maintained strong track records in R&D and strong links with business and industry. A brief chronology of higher education's contributions to economic growth through training is given in Appendix A.

Institutions of HE continued to grow through the first half of the 20th century. Phenomental growth, however, started in the 1950's, as a result of two major events. The first was related to the tremendous postwar economic growth and a concern on the part of US President Eisenhower for national security. In 1958 a bipartisan effort in Congress led to the passage of the National Defense Education Act based upon the belief that the nation's security required the fullest development of the mental resources and technical skills of its young men and women. The passage of this act was a reaction by Congress to Russia's launching of Sputnik. (Kaplin, 1978) The 1950's marked the beginning of a spectacular growth of federal R&D support to universities which peaked in the late 1960's and declined through the 1970's to the present time.

The second event in the 1950's was related to demography. Both the US Congress and the federal Administration were beginning to note the need for federal support for HE in response to the prospective tidal wave of enrollment caused by the baby boom. Federal support for HE increased steadily through the early 1980's. In PA, the Community College Act was passed in 1963 to assist in serving the college-bound baby boom generation and to provide for occupational and technical training on a county-wide basis. Community Colleges have traditionally had close ties to businesses and industries by offering customized occupational and technical training programs at the local community level. In 1966, the University of Pittsburgh and Temple University joined Penn State as state-related institutions. In 1969, the State Board of Education Regulators authorized approval of two-year programs in proprietary schools of business and technology. All of these activities were related in part to the Commonwealth's initiative to accommodate the education and training needs for the baby boomers. In 1984, PA has a HE system consisting of 14 state-owned universities, 3 state-related universities, 14 community colleges, 25 proprietary schools, 3 state-aided colleges, and 115 independent colleges and universities which includes 78 colleges and universities, 14 theological seminaries and 12 private junior colleges.

New initiations of support from the federal and state governments for the specific purpose of economic development ended with the several legislative enactments through 1964. Legislation enacted prior to 1965 which was specifically related to economic development continued, but the legislative priority shifted to EEO and institutional regulation, some of which was related to EEO.

As of the 1980's many state governments are prioritizing economic growth as a goal for HE funding as a result of diminishing strength of the economy. The federal government is making overtures to diminish its role as a funding source for HE, though there is currently a strong debate that R&D funding to universities, which eroded substantially through the 1970's should be increased for the purpose of sustaining technological advancement for national economic growth.

VI. LESSONS FROM OTHER STATES AND FROM THE LITERATURE IN GENERAL

As PA formulates strategies for its economic redevelopment, there are successful examples from other states' programs that enabled them to turn economic decline into growth.

The Massachusetts (MA) Case

Why compare the MA situation to PA? There are several similarities that affected economic decline in both states.*

*The statistics used in this list were obtained from the following sources: National Institute of Education's How States Compare in Financial Support of Higher Education, 1983-84; Peirce and Hagstrom, 1983; and the National Center for Education Statistics' The Condition of Education; Statistical Report, 1983.

1. Both states experienced massive levels of unemployment, but at different times. Massachusetts' rate peaked at its highest level (between 1970 and 1984) in 1975 at 11.2%. It has declined to a 1984 level of 4.8%, 2.7% below the national average. Pennsylvania's rate peaked in 1983 at 11.8% and was at 9.1% in 1984, 1.6% above the national average (Southwestern PA's rate, however, was still 10.5% as of December, 1984). PA is currently at an economic crossroad similar to that of MA in 1975.
2. Both states' economies relied on traditional manufacturing industries--steel and coal in PA; textiles and electronics (1950-70's) in MA.
3. Both states have aging populations which have increased substantially in recent years.
4. Both states have large and prestigious systems of private higher education.
5. Both states traditionally have been ranked low in terms of state aid to higher education.
6. Both states have a rapidly shrinking pool of high school graduates.
7. Both states lack the geographical/climatic appeal of the sunbelt and the mountain states.

1975 marked the crisis year in MA in terms of unemployment. The State was plagues with a rate (11.2%) which was well above the national average (8.5%). What occurred over the following nine year period was phenomenal economic growth which reduced MA's rate of unemployment to 4.8% by 1984. MA did not feel the effects of the 1981-82 national recession. A major key to the success of this state's recovery was the growth in small high technology firms which counteracted the previous losses in traditional manufacturing industries. The high-tech boom also lifted other sectors of the economy, providing more jobs in department stores, businesses and banking services. The literature suggests that in the growth which occurred along Route 128 out of Boston, MA's technical research universities (MIT was the leading force) were instrumental. There were three important reasons for this. First, there was an assurance of the availability of the highly skilled labor necessary. Second, commercially applicable research was being conducted at the MA Universities. Much of the university-based basic research (which could appropriately be called a long term research effort) of the late 1950's-1970's was a significant force in the expansion of the computer industry and establishment of the biomedical industry. The third reason is the cooperative efforts which occurred between academic and industrial research teams. One outstanding example of this was the creation of the Whitehead Institute for biomedical research at MIT in 1981, funded by Edwin C. Whitehead with an initial $127 million and $5 million annually thereafter for its operation. Other important business-university linkages have been created at Harvard, Stanford, Yale, University of California, Washington University, and many others. (Calder, 1983) Such investments from industry have helped MA universities to begin overcoming a critical problem common to most universities' basic research teams, which is aged research equipment and facilities.

Industry currently spends between $250-$300 million per year on university based R&D in university-developed technologies such as microelectronics, automation, and biotechnology. (Culliton, 1983) Edward David, President of Exxon Research and Engineering recommends tripling this amount over the next ten years. This suggests

that industry should be encouraged to increase funding of more fundamental (basic) rather than applied research in an attempt to reap commercial benefits in the longrun.

MIT's industry-funded research more than tripled in five years--from $6.7 million to $20.3 million during the period 1978-1982. Though MIT receives more federal R&D funds than any other university, funds increased only at a rate of 10% per year (1978-1982). Since federal funding support has declined, these newer relationships with industry will be critical for university research. (Ashford, 1983)

An MIT study (not specifically related to MA, but rather to the nation as a whole) suggests that the new jobs currently being generated are in new and smaller service, manufacturing and trade firms. (referenced in Hoy and Bernstein, 1981) This was also the case, specifically, in MA's economic revitalization. National projections indicate that this trend will continue.

Industrial decisions to locate along Route 128 in MA were two-dimensional. First, many of the companies were started by highly trained research scientists who were educated in MA universities. Second, the heavy concentration of outstanding research universities in the area was a major factor cited by new companies which re-located in MA. These companies liked MA for recruitment of quality human resources and for retraining purposes. (Hoy and Berstein, 1981) A 1979 US Congressional Joint Economic Committee Study reinforces this; it found that as businesses make decisions to locate or re-locate for expansion, the quality of schools (at all levels) ranks first and the availability of trained manpower ranks second. PA could use the MA experience as a guide to vigorously promote its own fine research universitiies as an essential part of the Commonwealth's efforts to attract new businesses.

Massachusetts is now taking a look at strategies to sustain growth by calling for adaptability of higher education curricula and resources to contribute appropriately to sustained regional economic development. Regional manpower planning viewed as a must in MA will be enhanced by the appropriate role of HE.

MA's support of higher education has in the past been ranked low nationally. MA Governor Dukakis has taken an agressive stand toward fostering the State's role in providing leadership and the mechanisms for cooperation between HE and industry and for stabilizing financial support for education at all levels. (Dukakis, 1984) The literature suggests that in order for the US to sustain its current level of expansion into high tech fields for continued economic growth, educational institutions (at all levels) must raise students' achievement levels of science, math, communication and analytical skills.

The New England Board of Higher Education, created as an interstate compact of the six states in 1955, has recently sponsored studies on the link between higher education and economic development. The publications point out the critical importance

of quality higher education for sustained regional economic growth. One of the publications provides a good state-by-state (and totally for the region) review of enrollment figures, degrees earned and projected needs for future degrees, funding information, business climate rankings, employment changes and projections, data on job openings, R&D funding statistics, GDP statistics and much more. This information might be quite useful to most states for purposes of policy formulation in HE. (Hoy and Bernstein, 1981 and 1982; Commission on Higher Education and the Economy of New England, n.d.)

In contrast to the similarities between MA and PA, there are also some differences. What follows is a list of these differences.*

1. Massachusetts was quick to invest in the commercialization of scientific advances at universities in the state. Pennsylvania has been slow, however, as of 1983, PA is beginning to do so (Carnegie Mellon University's efforts via Department of Defense Grant).
2. Average percentage increase in HE enrollment differed substantially in these two states. Though both states have populations which are aging, MA is ranked 16th while PA is ranked 37th in percentage increases in enrollment.
3. Net migration of first time freshmen differ--whereas MA ranks 15th out of 37 states with positive net migration, PA ranks 36th, with a net gain of only 1%.
4. Although MA has traditionally ranked well below the average in its contribution to public higher education (as has PA), this is changing. 50.1% of public institutional funding came from state and local government in MA in 1981; the equivalent figure for PA is 38.3%.
5. Similarly, by 1983, MA was ranked 10th in per student appropriations; PA was ranked 24th.
6. Levels of R&D expenditures are higher in MA universities than they are in PA.

Certain of the above might be considered as PA sets a direction and plans for economic redevelopment. Key among the lessons learned in MA are:

-MA's ability to attract more students to its colleges and universities in terms of percentage increases from year to year
-MA's successful efforts of attracting a high number of students from out-of-state; HE is MA's leading "export" industry
-MA's level of support for HE is on the increase in order to maintain high quality education to attract high quality students, many of whom are expected to remain in MA and contribute to sustaining the economic growth there

Aggressive efforts in terms of the above will enable MA colleges to counteract the impacts of the predicted declines in the number of college-bound 18-24 year olds in the State over the next ten years.

In addition to the MA experience, where recent state (and regional) economic development efforts have been successful, colleges and universities have been key actors. In the Silicon Valley of Northern California the universities (most specifically Stanford and University of California, Berkeley) took pro-active roles in that expansion, establishing strong informal linkages with business and industry of the San-Mateo and Santa Clara communities. The Silicon Valley attracted many firms and spawned many

*Please refer to the footnote on p.7 for the sources used to compile this information.

more as the "chip" permitted for better calculation, for faster manipulation of data and for the striking improvement in telecommunications; this expansion resulted from university-based research that was applied by the private sector.

In North Carolina, Research Triangle Park was specifically located a short distance from three university campuses (Duke, N.C. State and University of North Carolina, Chapel Hill) as a planned effort for industrial development. The intention was to establish and coordinate scientific research in order to induce high tech industrialization.

In the Boulder and Denver areas of Colorado, development resulted from the coming together of the University of Colorado management, business leadership, state industrial developers and bankers who initiated the coordinated efforts for computer, automation and financial management expansion.

The New England area is not the only place in the country where higher education is presently viewed as a key to sustaining economic development. In 1981 the State of Florida appropriated an extra $88 million for its universities to "turn its higher education system into one of the most respected in the country." This, coupled with Florida's geographic appeal could contribute to a large out-of-state student draw to Florida. (Miller, 1981) The State of California appointed a long term post-secondary education commission to look at long term needs of the State for post-secondary education from 1985-2000. (Commission Report, January, 1984); similar planning efforts are occurring in Ohio, North Carolina, Kansas and others.

VII. PENNSYLVANIA'S CURRENT SCENARIO

Recent HE-related economic development efforts in PA have been notable. In Southwestern PA, where unemployment remains well above the State average (10.5% in December, 1984 vs. a State and National rate of 7.4% and 7.2% respectively), a working document outlining the "State of the Region" for purposes of economic revitalization has been prepared by the University of Pittsburgh's Center for Social and Urban Research. (Sept., 1984) The Allegheny Conference on Community Development published an action plan for regional economic growth. (Nov., 1984) The Conference has also proposed a $5 million "seed fund" for promising entrepreneurs and plans call for the awarding of the first loans in 1985. (Pittsburgh Press, January 29, 1985) High-tech industrial growth in this region is occurring at an estimated 20% annual rate; there are currently about 415 firms in the area. (Pittsburgh Press, February 5, 1985) Some of the entrepreneurs involved have been scientists trained in local universities.

At the State level, a notable project was established by the General Assembly in 1982--the Ben Franklin Partnership Challenge Grant Program for Technological Innovation, creating university-coordinated centers in four sections of the State: the northeast tier (Lehigh); western (Carnegie Mellon and the University of Pittsburgh); central (Penn State); and eastern PA (University City Science Center, Philadelphia). Funds

must be matched at an equal (many are matched at a greater) rate by the private sector in support of R&D projects, education and training projects. The State's start-up funding was $1 million per center for the first six months, followed by total increases to $10 million and $18 million for all centers combined for 1983-84 and 1984-85 respectively. The Ben Franklin Partnership Program has shown tremendous success in several ways:

-Development of important university-business-state government linkages for economic development
-Specialized training of 5,024 individuals (4,596 graduates)
-Start-up of 77 firms
-Creation of 428 jobs
-Expansion of 52 firms, with creation of 55 jobs from the expansion
-Retainment of 386 jobs

Returns to date on this State financial investment appear to be high (BFP Program Progress Report, 1984)

Colleges and universities have contributed in a number of other ways to PA's economic revitalization. A small sample of three such efforts is summarized below.

SAMPLE OF RECENT COLLEGE AND UNIVERSITY EFFORTS TOWARDS PENNSYLVANIA'S ECONOMIC REVITALIZATION*

Below is a list of efforts that have been made by three institutions of higher education in Southwestern Pennsylvania, an area of the State where such efforts are important because unemployment rates are still much higher than the State's average. The examples selected were to represent a private institution of higher education, a State-related university and a community college. The list (for each institution) is not complete, but rather serves as a review of some of the new innovations. This list does not include the on-going efforts of these institutions in raising the quality of the labor force in general or the many on-going research efforts that are contributing to the advancement of knowledge.

Carnegie Mellon University, Pittsburgh, PA

1. $103 million contract with US Department of Defense to direct a Software Engineering Institute--first such institute in the country. The Institute is expected to employ approximately 250 people. Projects will enhance national defense, the high tech industry in general and the local economy.
2. CMU is the leading university in the country for robotics research.
3. CMU has a joint venture with IBM in computer research, designing the next generation of computer systems.
4. Has taken a lead in establishing computer-based classrooms which allow students to work "on-line" to solve a number of real life problems. Examples: (a) financial management students have access to corporate financial statements for problem-solving purposes; (b) communication and rhetoric is taught with direct feedback to students.
5. CMU and the University of Pittsburgh are the Western PA sponsors for the Ben Franklin Partnership Act which was previously referenced in the text of this paper.
6. Research faculty (science, business and public management, computer science, engineering, etc.) serve as consultants providing technical assistance, contributing improved quality of services and product development. There have also been a number of spin-off companies established from these relationships.
7. CMU and University of Pittsburgh have leased space to a local non-profit developer to assist in the development of start-up companies, providing "incubator space".

Community College of Allegheny County (CCAC), Pittsburgh, PA

1. Allegheny County Commissioners allocated approximately $3.2 million to CCAC to cover tuition, fees and book costs for a dislocated workers retraining program from Spring 1983 to the present. CCAC is providing counseling, job search skills, non-credit and credit career-related and transfer programs to the 8,000+ persons who have been served to date.
2. CCAC has developed a teller and secretarial training program in cooperation with Mellon Bank utilizing federal Job Training Partnership Act funds. There was a 95% job placement rate of program participants in the first of the two classes. The second class is still underway.
3. CCAC has received three years of funding (to begin in March, 1985) from the Allegheny Conference on Community Development for one full-time College employee to take leave to coordinate training for business and industry (College will provide the training).
4. CCAC offers a Small Business Certificate training program for county residents interested in starting small businesses (offered in conjunction with the US Small Business Administration).

University of Pittsburgh (Pitt), Pittsburgh, PA

1. The Center of Social and Urban Research of the University has completed several research projects relating to economic regional development (the most recent was referenced in the text and has been included in the bibliography).
2. A Pitt affiliate known as the Foundation for Applied Science and Technology (FAST) identifies research that's on-going at Pitt that has applicability for commercial development. FAST may accrue funds from industrial support of projects to be held over and used in future years to fund research projects.
3. Pitt is one of the two University partners in Western PA's Ben Franklin Partnership Center. (see #5 under CMU list)
4. Pitt is currently negotiating with Chevron (new owner of a Gulf Oil Research facility located in Harmarville, PA) to obtain the center in order to foster applied research and light manufacturing.
5. Similarly to CMU's faculty research consulting (see #7 listed under CMU sample) faculty of social work, education, chemistry, business, biology, engineering, public/international affairs and several others are engaged in such efforts.
6. Applied DNA Systems, Inc., located in Webster Hall, Pittsburgh, PA, serves as a liason between industrial corporations and members of the university-based biological scientific community; Maurice Sussman, Pitt Professor of Biochemistry and Genetics of Development is one of several nationally renowned university scientists serving on the ADS Board.
7. Small Business Development Corporation in the School of Business provides consulting services to small developing businesses.
8. University of Pittsburgh and CMU have leased space to a local non-profit developer to assist in the development of start-up companies, providing "incubator space".

*Most of the information listed above was provided in telephone or personal interviews with: Dr. Brian Barry, CMU; Dr. Roger Ahlbrandt, Pitt; and Dr. James Holmberg, CCAC. Their time and cooperation with this project are appreciated.

VIII. SUMMARY

Key Consideration for Economic Redevelopment

This review of the relationship between higher education and economic development suggests that there are six key considerations for economic redevelopment for the 1980's:

-Business/Industry, Government and University linkages are a must; the task is too complex for one sector to deal with alone.

-Where recent state (and regional) economic development efforts have been

successful, colleges and universities have been key actors in the overall effort.

-Both basic and applied R&D are critical for economic growth and universities have proven to be excellent locations for pursuing basic research.

-The federal government has urged universities to seek more private sector R&D funds. (Harrisburg Evening News, February 25, 1985) States must be instrumental in providing leadership and the mechanisms for the linkages that are necessary to foster this for long term economic redevelopment.

-Much of the post-industrial economy will be based upon jobs which are intellectually challenging, resulting from high rates of technical change which will call for rapid learning and adaptation. Schools (at all levels) must be instrumental in preparing the work force for this.

-HE must play an increasingly greater role in manpower planning and training.

Pennsylvania Specific Issues

Based upon the six considerations above, there are several issues specific to the PA case that are worth noting to establishing a framework for policy. The Commonwealth has made a substantial investment in higher education. Our analysis suggests that to further maximize returns of this investment by broadening HE's role in economic redevelopment, the Commonwealth might consder these three key strategies.

1. Strengthen the HE attainment levels of PA residents by increasing the college attendance ratio of high school graduates (PA rated 49th out of 51 nationally, Fall 1983; NIE 1983-84 report).

2. Strengthen the Commonwealth's HE system by:

   -encouraging on-going business-HE linkages, like those resulting from the Ben Franklin Partnership Program.

   -encouraging industrial investment in university-based R&D which will serve as a long term economic development strategy.

   -considering the development of an interstate approach to HE planning similar to the 3 compacts established by the Southern, Western and New England States that will serve as a long range planning strategy to solve regionally shared problems.

   -revising the 1971 HE planning document to include economic development as a major objective.

   -paying careful attention to the several national studies on the quality of higher education (three have been completed as of March, 1985), as they may apply to PA's planning process.

   -beginning to devise strategies to measure the contribution of HE's "indirect impacts" on economic well-being, in order that issues of accountability, duplication, institutional outcome analyses, and the like are addressed as part of the planning process.

3. Develop a system that is highly competetive in relation to other states' HE systems by:

   -increasing PA's net gain in the migration of quality students.

   -analyzing per student tuition rates in terms of their making it fiscally advantageous for quality in-state residents to seek HE elsewhere; PA's per student tuition is third highest of all 50 states.

   -likewise, tuition rates may make it difficult to attract quality out-of-

state students who upon graduation may remain in PA and contribute to the economy.

-promoting the actual high quality of life in PA in an effort to attract both out-of-state students and new businesses; PA has an image problem (a reputation as a heavy industrial state plagued with a poor environmental quality and urban decline).

IX. ANNOTATED BIBLIOGRAPHY FOR USE BY HOUSE HIGHER EDUCATION SUB-COMMITTEE STAFF MEMBERS

The representative who initiated the inquiry that has led to the preparation of this paper also requested a brief annotated bibliography which might be useful at the onset to the staff of the House Sub-committee on Higher Education. The 12 text and journal entries; 9 Pennsylvania-specific documents; 4 non-Pennsylvania strategies; and the list of 8 key contact which are given below have been selected so that those Committee persons assigned to study higher education/economic development might at least benefit from a preliminary literature search.

A. Texts and Journal Entries

Carnegie Foundation for the Advancement of Teaching. Three Thousand Futures: The Next Twenty Years for Higher Education. San Francisco: Jossey-Bass, Inc. 1980.

An excellent review of the outlook for higher education based upon the changing demographic, fiscal and social conditions of the country. A good basic book with implications for policy formulation. Of specific interest to HE and economic development are 2 supplements: Supplement C--"The Labor Market and Higher Education" and Supplement J--"A Comparative Review of Scholarly, Scientifc and Technological Progress in the US."

Commission on Higher Education and the Economy of New England. A Threat to Excellence: The Report of the Commission on Higher Education and the Economy of New England, n.d.

In the Spring of 1979, the New England Board of Higher Education formed a special 33 member Commission to explore the relationship between higher education and the economy in the six-state region. Wide cross-sectional membership (college/university professors & presidents, business persons; bankers, corporate chairs, state senators, news media representatives). Reported findings in 1982 called for: developing more complete understanding throughout region of the relationship between quality of the educational system and the performance of the region's economy. Point out the impact a good higher education system (as that in New England) has in attracting good people to the region. Calls for critical need to maintain a competitive edge in HE in relation to other regions. Calls for on-going dialogue and linkages between business, education and government to HE systems to maintain flexibility, to respond to changing manpower needs. Call for an increase in the share of state support as a long term investment for the region's economic vitality. A copy of this report can be found in Hoy and Bernstein's Financing Higher Education: The Public Investment, 1982.

Davis, J. Ronnie and Morrall, John F., III. Evaluating Educational Investment Lexington: Lexington Books, 1974.

Includes a good review of the earlier studies completed on educational investment and economic growth (including the work of T.W. Schultz, E.F. Denison and H.J. Bowman) in terms of human capital formation.

Froomkin, Joseph, ed. The Crisis in Higher Education: Proceedings of Academy of Political Science. 35 (2 1983).

This entire edition of PAPS is dedicated to higher education and includes such topics as 1) The Outlook for Corporate Aid to Higher Education; 2) Rehaping Federal Aid to Higher Education; 3) Cost Control in Higher Education and others.

Gordon, Margaret S., ed. Higher Education and the Labor Market. NY: McGraw-Hill, 1974.

A volume of essays sponsored by the Carnegie Commission on Higher Education dealing with selected issues concerning the relationship between higher education and labor market.

Groves, Harold M. Education and Economic Growth. Washington, DC: The Committee on Educational Finance of the National Education Association, 1961.

A study of the relationship between education (all levels) and economic growth because of the growing interest among the nation's economists in education as an investment in the nation's business future. Considerable evidence showing a strong positive correlation between educational development and per capita income. This text is good but somewhat out-of-date.

Hoy, John C. & Berstein, Melvin H., eds. Business & Academic; Partners in New England's Economic Renewal. Hanover, NH: Univ, Press of New England, 1981.

The papers included in this book define the role of higher education in the planning and implementation of regional economic policy. It includes specific ways in which the region's colleges and universities can act collectively to contribute to continued economic prosperity in New England. This is an excellent "idea" and strategy book to review for higher education's role in economic development. Good overview of strategies for HE that may have applicability for PA.

Hoy, John C. and Bernstein, Melvin H. Financing Higher Education: The Public Investment. Boston: Auburn House Publishing Company, 1982.

Topics include: Underfunding and overtaxing in New England (NE): Higher Education (HE) as an economic investment; financing the future of HE in NE; HE in the gross domestic product of the NE states; Cooperation and economic policy; tax policy--issues for HE; Absence of national policy. Highly recommended for perusal in terms of an excellent overview on subject of higher education and economic development issues for state policy.

Leach, James A. & Sanders, Carol S. Education for Employment Planning for Economic Development: A Strategic Approach. Urbana: University of Illinois, 1983.

Prepared to provide business, industry, labor, government, and education groups with an overview of economic (ED) development and give them ideas for the ED planning process.

McMahon, Walter W. Investment in Higher Education. Lexington: Lexington Books, 1974.

A good review of higher education and economic development. Looks at several studies which have been designed to analyze the rates of return on investment in education. Covers training roles and R&D roles, historically and with a more up-to-date critique than Groves.

National Academy of Sciences, National Academy of Engineering & Institute of Medicine. Strengthening the Government-University Partnership in Science. Washington, DC: National Academy Press, 1983

Report of the Ad-Hoc Committee on Government-University Relationships in Support of Science and Committee of Science, Engineering and Public Policy. This publication was a result of past decade of strained relationship

between Federal Government and universities re. federally funded scientific research and concern over the deterioration of the relationship. Project charge came from Dr. Philip Handler, then President of National Academy of Science Purpose is to do ground work necessary to bring into being a continuing forum to facilitate understanding between government and university communities to promote resolution of their disagreement over major issues of policy. Saw an overwhelming need for better mutual understanding among the partners.

Sloan Commission on Government and Higher Education. A Program for Renewed Partnership. Cambridge: Bollinger Publications, 1980.

A study which looks at higher education and its relationship to government (state and federal) at the present time when the past unprecedented expansion and change has given way to a time of enrollment decline and retrenchment. Looks at issues of: 1) institutional freedom and government authority, and 2) academic institutional roles in terms of responsiveness to social needs. Contents include context of problems, federal regulations, role of the States, financial aid, federal support for academic research, government and education of physicians.

B. Pennsylvania-Specific Documents

Allegheny Conference on Community Development. A Strategy for Growth: An Economic Development Program for the Pittsburgh Region. Vol.1. Pittsburgh: ACCD, November, 1984.

Presents a comprehensive picture of the Pittsburgh region's economy in mid-1980 and a plan for action to rebuild a strong economy for the region. The report was the result of the Conference's Economic Development Committee project with membership representing a wide cross-section of the community. A good working document for the region.

Ben Franklin Partnership Board. F. Roger Tellefsen, Executive Director of the Ben Franklin Partnership and Advanced Technology, Commonwealth of PA, Department of Commerce, 463 Forum Building, Harrisburg, PA 17120 717-787-4147.

Mr. Tellefsen can provide you with several documents which will outline the numerous activities occurring across the state that involve colleges, universities, businesses and industries in BFP partnership for economic development from 1983 to the present.

Department of Labor and Industry. Pennsylvania Occupational Information System: Labor Demand-Supply Relationship Component. Harrisburg: Commonwealth of PA, Summer, 1984.

This document reviews labor supply-demand projections for the state through 1990 and could be extremely useful for higher education planning purposes.

PA Economy League, Inc., Eastern Division, 215 South Broad Street, Philadelphia PA 19107.

The Economy League completed an extensive study of the State's colleges and universities and their direct impact upon the economy. The three reports which review the League's study can be obtained through the address listed above. They include a case study report, a statewide impacts report and a summary overview report called "The Economic Impact of Higher Education on Pennsylvania." The reports were published in 1981.

Pennsylvania State Planning Board. Choices for Pennsylvania: Citizens Addition. Harrisburg: Commonwealth of PA, 1980.

Condensed version of technical report which was completed by the PA State Planning Board. The full report was a comprehensive look at the State's past and its future in 1) economic development and 2) community conservation. Full technical report may be useful.

Sack, Saul. History of Higher Education in Pennsylvania. Harrisburg: The PA Historical and Museum Commission, 1963.

A 2-volume look at the history of higher education in PA through the early 1960's. Very thorough but a little difficult to get through. This was the only HE specific text found.

Toombs, William and Wilkinson, Robert. An Inventory of Research Units in PA, June, 1983. The Technical Report.

A project that identified more than 1,200 academic and corporate research units within Pennsylvania is described, and a user's guide to the project's data file is provided. The Pennsylvania Research Inventory Project is an online data system designed to promote economic development, particularly within the Appalachian region of the state. The system provides information on personnel, organizational units, areas of specialization, level of activity, and facilities and equipment. The target audience is the business-oriented user, particularly those exploring new areas of activity or contemplating a change of location. Uses of the reference file include: generating specialized mailing lists, locating specialized research activities, identifying the sites of equipment and facilities, summarizing regional patterns of research, identifying individuals with specific competencies, and providing a cross-reference between academic and industrial research. The project employs the Stanford Public Information Retrieval Systems (SPIRES), which is described in the user's guide. Sample letters to research groups, survey forms, and standard industrial classification codes are appended.

Trindell, Roger "Applied Geography at a Small State College." Paper Presented at the Annual Meeting of the National Council for Geographic Education, San Diego, October 27-30, 1982. ERIC Document #ED 227038.

The geography department at Mansfield State College, PA has maintained and even increased enrollment by expanding into a Department of Geography and Regional Planning and by offering internship programs to its students. Goals of the department are to develop special emphasis in environmental planning, resource management, recreational planning and management, economic development, and a cartographic technician program. The internship program requires that each student spend an entire semester in a planning agency. Also, several of the faculty serve on local planning commissions. A number of studies including comprehensive plans, zoning ordinances, a resource management plan, recreation plans, housing surveys, market studies, income surveys, and population studies have been produced. In addition, a current travel-tourism emphasis has attracted mostly female students directly from high school. The successes of this program are attributable to merchandising, including the development of brochures, newspaper articles, and a video film.

University Center for Social and Urban Research. The State of the Region: Recent Economic, Demographic and Social Trends in Southwestern PA. Pittsburgh: University of Pittsburgh, September, 1984.

An extensive review of the major structural changes that have occurred in Southwestern PA's economy since 1950. Contains analysis of: civilian labor force, employment and unemployment; employment in manufacturing industries; employment in non-agricultural industries; analyses of basic steel, bituminous coal industries and health sector; review of population, income and education; includes a summary and implications.

C. Sample of Documents Outlining Other States' Strategies That Might Be Useful

California State Postsecondary Education Commission. A Prospective for California Postsecondary Education, 1985-2000. Sacramento: CSPEC, January 30, 1984. ERIC Document # ED 247832.

Long term needs of California for postsecondary education and state's ability to meet the needs will be reassessed by the California Postsecondary Education Commission. Assumptions of the Commission's current long-range planning effort are briefly reviewed. The scope of postsecondary education will include public and private nonprofit and proprietary institutions. Areas of inquiry will likely concern: the impact of demographic changes, the state's ability to fund postsecondary education, the role of colleges in the economic development of the state, and the impact of societal change and work on postsecondary education. The topics of four background papers and one policy paper that will be generated are described. Background papers will primarily be concerned with forecasts based on reasonable projections for 1985 to 2000. In addition to a review of statewide long-range planning, the papers will cover the following concerns for 1985-2000: social and economic trends; population and enrollment trends; financial support for California postsecondary education and policy issues for post-secondary education. The kinds of subjects and questions that are likely to be addressed for each paper are identified.

Campbell, Dale F. and Faircloth, D.M. "State Models for Economic Development." Community and Junior College Journal. 52 (7 April 1982): 18-9.

Examines the community college's role in state economic development, describing the North Carolina model, which teams community colleges and the department of commerce to insure adequate program funding. Encourages similar linkages in other states to provide resources for occupational training of skilled workers in high technology, critical manpower shortage occupations.

Graff, Warren H. "Strategic Planning for Economic Development" Paper presented at the Economics Section Colloquium of the Ohio Academy of Science, April 27, 1984. ERIC Document # ED 247824.

The relationship of postsecondary education to the economy in Ohio is discussed. Attention is focused on efforts of the Ohio Board of Regents and the Ohio Department of Development to foster economic development and revitalization. Information is included on the Ohio Board of Regents' "Master Plan for Higher Education," along with initiatives for economic revitalization contained in "Toward a Working Ohio," are also identified, and perspectives on strategic planning and management for economic development are offered. Information on the number of establishments by industry is included to help identify critical issues and trends. Appendices include: action agendas for job creation, job training, quality education, control of health care costs, tax reform, and streamlining state government; a

list of strengths, weaknesses, opportunities, and threats in the state; a conceptual framework for the relationship between research and development and economic development; an analysis of mechanisms intended to meet selected needs; a list of technological advances since 1950's; and a list of 22 measurement factors used in determining Ohio's position in general manufacturing business climates and rankings of 48 states based on the 22 factors.

Xyle, Regina M. "Partners in Economic Development." New Directions for Experiential Learning. 13 (September 1981): 97-108.

A key element for economic revitalization, the local labor market development, can be supported by colleges and universities in coordination with business and government. The Human Resources Management Center, a strategic model for managing economic dislocations, is described.

D. National Commissions and Associations to Contact for Information and Reports

American Association of Community and Junior Colleges. 1 Dupont Circle, N.W., Suite 410 Washington, DC 20036. 202-293-7050.

AACJC has prepared two concept papers entitled: 1) Putting America Back to Work, March 26, 1982; and 2) Putting America Back to Work Phase II.

Association of American Colleges. 202-387-3760.

The Association has just issued (2/85) its report on undergraduate education. This, and the several other reports related to "excellence in higher education" (the new series that has stemmed from those which looked at education at the lower levels over the last three years) will have implications for statewide planning of higher education for economic growth. Three have been completed to date: 1) the Fall 1984 study "Excellence in Undergraduate Education" which was the final report of the Study Group on the Conditions of Excellence in American Higher Education; (the text of this report can be found in the October 24, 1984 edition of the Chronical of Higher Education); 2) in November, 1984 the National Endowment for the humanities issued its report calling for a restoration of coherence and vitality to undergraduate humanities programs (see the November 28, 1984 Chronicle of Higher Education for a review; and 3) AAC's report entitled "Integrity in the College Curriculum: A Report to the Academic Community (see the February 13, 1985 Chronicle of Higher Education for the text of this report.

Business Higher Education Forum. 1 Dupont Circle, Suite 800, Washington, DC 20036. 202-833-4716. Contact Person: Don M. Blandin, Association Director.

The Forum is an affiliate of the American Council on Education and is an organization composed of 85 of the country's top corporate and college/university leaders who are interested in establishing business-university linkages to regain US industrial competitiveness. Mr. Blandin can provide you with the Forum's studies which include: "America's Competitive Challenge"; "Corporate and Campus Cooperation: An Action Agenda;" and "The New Manufacturing: America's Race to Automate."

Carnegie Foundation for the Advancement of Teaching. Princeton, NJ Office: 609-452-1780. Contact: Maria Ucelli or Carol LaSala.

The Carnegie Commission will soon be publishing two studies that might be useful. The first is expected to be available in May 1985; it outlines the policy role for the federal government in higher education. The second is an extensive analysis of undergraduate liberal arts education (LAE) which I was told has a comprehensive review of LAE and economic factors. A report issued in January, 1985 by the Foundation looks at corporate involvement in offering education programs. It may have implications for HE planning.

Education Commission of the States. Suite 300, 1860 Lincoln St., Denver, CO, 80295. 303-830-3600. Contact Person: Martin M. Ahumada, Postsecondary Policy Analyst.

The Commission focused its research efforts on the lower levels of education for economic growth in 1982-83 and published several reports one of which was completed by their Task Force on Education for Economic Growth called "Action for Excellence" in 2/83. The Commission is focusing on higher education for economic growth in 1985. It is probably wise to keep in contact with Mr. Ahumada in order to obtain copies of their policy studies.

National Bureau of Economic Research, Inc. 1050 Massachusetts Avenue, Cambridge, MA 02138. 617-868-3900

The Bureau has published several excellent studies, some of which look at education and economic development. Some that might be of interest to you include: (a) Economic Research: Retrospect and Prospect, Vol.6 on Human Resources by T.W. Schultz (1982 University Microfilms); (b) Higher Education & Earnings: College as an Investment and Screening Device by P.J. Taubman and T. Wales (1974 University Microfilms); (c) Education as an Industry by D.T. Jamison, R. Radner and J.N. Froomkins (1976); and (d) Elasticities of Demand for Educated Labor (1982).

National Education Association. 202-822-7749. Contact Person: Dr. William Graybeal.

The NEA has just published a major study which focuses on education and economic growth titled The Strategic context of Education 1985-1995. Unfortunately, I was unable to obtain this document for review and thus cannot give you a more specific annotation.

National Center for Research in Vocational Education, Ohio State University, 1960 Kenney Road, Columbus, Ohio 43210.

The national center has several publications outlining strategies to assist the unemployed dislocated worker including "Helping the Dislocated Worker: Planning Community Services"; "Re-employment Assistance for Laid-Off Workers"; and "Helping the Dislocated Worker: Sample Programs". This center has prepared approximately 21 papers on productivity and economic development--specific to human resource development and approximately 29 papers on linkages with business, industry and labor. Publication or a bibliography of publications can be ordered from the above address.

APPENDICES

CONTENTS:

A. Chronology of Important Dates in History of Higher Education Contributions to Economic Growth through Training

B. References Used in Paper

APPENDIX A

CHRONOLOGY OF IMPORTANT DATES IN HISTORY OF HIGHER EDUCATION CONTRIBUTIONS TO ECONOMIC GROWTH THROUGH TRAINING

The following chronology was adapted from the only complete volume on the history of higher education in PA which this writer was able to find. Unfortunately, the study utilized was organized topically rather than chronologically, making this task extremely tedious and time consuming. Thus, the dates listed below are merely a guideline as to the chronology of some of the important events which established the first training programs in the State. It is by no means complete, merely giving a listing of the institutions involved in the establishment of the first training programs in various field of study.

A. Legal Education

1832 University of Pennsylvania established a law professorship
1834 Dickinson College Law School opened (Bachelor of Law degree conferred); school disbanned 12 years later and re-established in 1890.
1821 University of Pittsburgh limited admission into its law school to those applicants who had completed four years of college work.

B. Medical Education

1750-65 University of Penn, Medical School (first in the country)
1821 First pharmacy, University of Penn
1850 Legislature chartered first Dental School--Philadelphia College of Dentistry but school was terminated in 1856; 1878 University of Pennsylvania established a Dental School; 1896--University of Pittsburgh
1878 First Vetinary School established, University of Penn
1886 First Training School for Nurses, Univeristy of Penn
1915 First Department of Chiropody established at Temple University (2nd in the country)
1917 Legislation passed to allow for establishment of school of optometry, followed by opening of the Pennsylvania State College of Optometry in 1919 (Philadelphia)

C. Science and Technical Education

1. Agriculture & Technology

1821 Early effort began, establishing natural and agriculture sciences by Allegheny College; followed by Madison College (1827); Lafayette College (1832); Allegheny College (1833)
1852 Early efforts of curriculum development, Bucknell University
1861-62 Agriculture College of PA established by legislative action of State then named as the State Land Grant College via Morrell Land Grant Act (1962); became Penn State College (1874); became Penn State University (1953)
1907 Forrestry, Penn State University
1908 Home Economics, Penn State University
1907 Sanitary Engineering, Penn State University
1913 Commerce, Penn State University

2. Engineering & Mechanical Drawing

1837 Dickinson College establishes first program, followed by University of Pittsburgh (1847)

3. Fine and Industrial Arts

1848 Philadelphia School of Design for Women (merged with and became the Moore School (1932)

1884 Philadelphia Textile Institute established

4. Institute of Technology--traditionally have had the closes link to business and industry.

1886 Lehigh Polytechnic College (as addition to Lehigh University)
1891 Drexel Institute of Technology
1905 Carnegie Institute of Technology

5. Science and Technical Education

1850 Need for a separate science and technical education curriculum realized statewide
1852 Curriculum established at University of Penn, Bucknell
1855-69 Curriculum established at University of Pittsburgh
1904 First BS degree in Science and Chemistry confirmed, Bucknell; by that time, almost all PA colleges and universities had begun programs leading to Bachelor of Science degrees

6. Other Technical/Vocational Programs

1875 Music School, University of Pennsylvania
1881 Business School, University of Pennsylvania (Wharton School of Finance and Economics, as it was then known, was the first Business School in the country)
1906 Journalism, University of Pennsylvania; 1914, University of Pittsburgh
1927 School of Fine Arts, University of Pittsburgh
1931 School of Social Work, University of Pittsburgh

D. Teacher Education

1857 First State Normal Schools for Teacher Training established (Edinboro and Millerville)
1907 College Courses offered for Teachers, Penn State University
1935 B.S. in Education, Muhlenberg College
1910 School of Education established, University of Pittsburgh
1919 Research Station for Education established at University of Pennsylvania upon request of US Bureau of Education
1923 First graduate school (MS degree established at Temple; followed by Temple's Ed.D Program in 1925)
1927 Division for research of education problems established, University of Pittsburgh
1926-32 State Normal Schools became State Teachers Colleges and given authority to grant Bachelor of Science Degrees

Adapted from the following publication:

Sack, Saul. History of Higher Education in Pennsylvania, Vol. 1 and Vol. 2. Harrisburg: The Pennsylvania Historical and Museum Commission, 1963.

APPENDIX B

REFERENCES USED IN PAPER

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